The Commonwealth of Massachusetts
Executive Office of Human Services
Department of Public Health
150 Tremont Street
Boston 02111

Bailus Walker, Jr., Ph.D., M.P.H.
COMMISSIONER

PCB EXPOSURE ASSESSMENT IN NORWOOD

Prepared By:

Martha Steele, M.P.H.
Division of Environmental Health Assessment

February 22, 1984

PCB Exposure Assessment in Norwood

INTRODUCTION

Although the manufacture of polychlorinated biphenyls (PCBs) was banned in the United States in 1979, exposure to these compounds continues due to past uncontrolled disposal in waterways, landfills, and other properties. An example of such uncontrolled disposal occurred in Norwood, Massachusetts (population 29,945), where PCBs were recently discovered in a field near a plant that formerly manufactured capacitors and transformers. Soil concentrations in the field were as high as 220,000 ppm.

It was not immediately known how much exposure to the PCBs had occurred, since they appeared to be confined to certain "hot spots" (see figure 1). The field had long been used, however, by local residents as a recreational area. Furthermore, two residential streets abutted the site. Thus, the potential for exposure existed.

PCBs are a well known contaminant to the general public. Concern heightened when EPA officials said these levels were the highest ever found in soils in the United States. Extensive media coverage followed, and residents demanded immediate action.

This report describes the steps the Massachusetts Department of Public Health (MDPH) undertook to evaluate possible PCB exposure of local residents. Given the circumstances, the Department had to act quickly with a rational plan.

THE SITE

Figure 1 is a map of the site (located in what is known as the "Meadowbrook" area). Biking and playing sports on the site were common among children of the area. In addition, a small creek ran through the site, and children often played in the creek. Residents used paths through the field to walk to nearby stores. A week-long carnival was held on the site once a year. Others jogged or picnicked in the area.

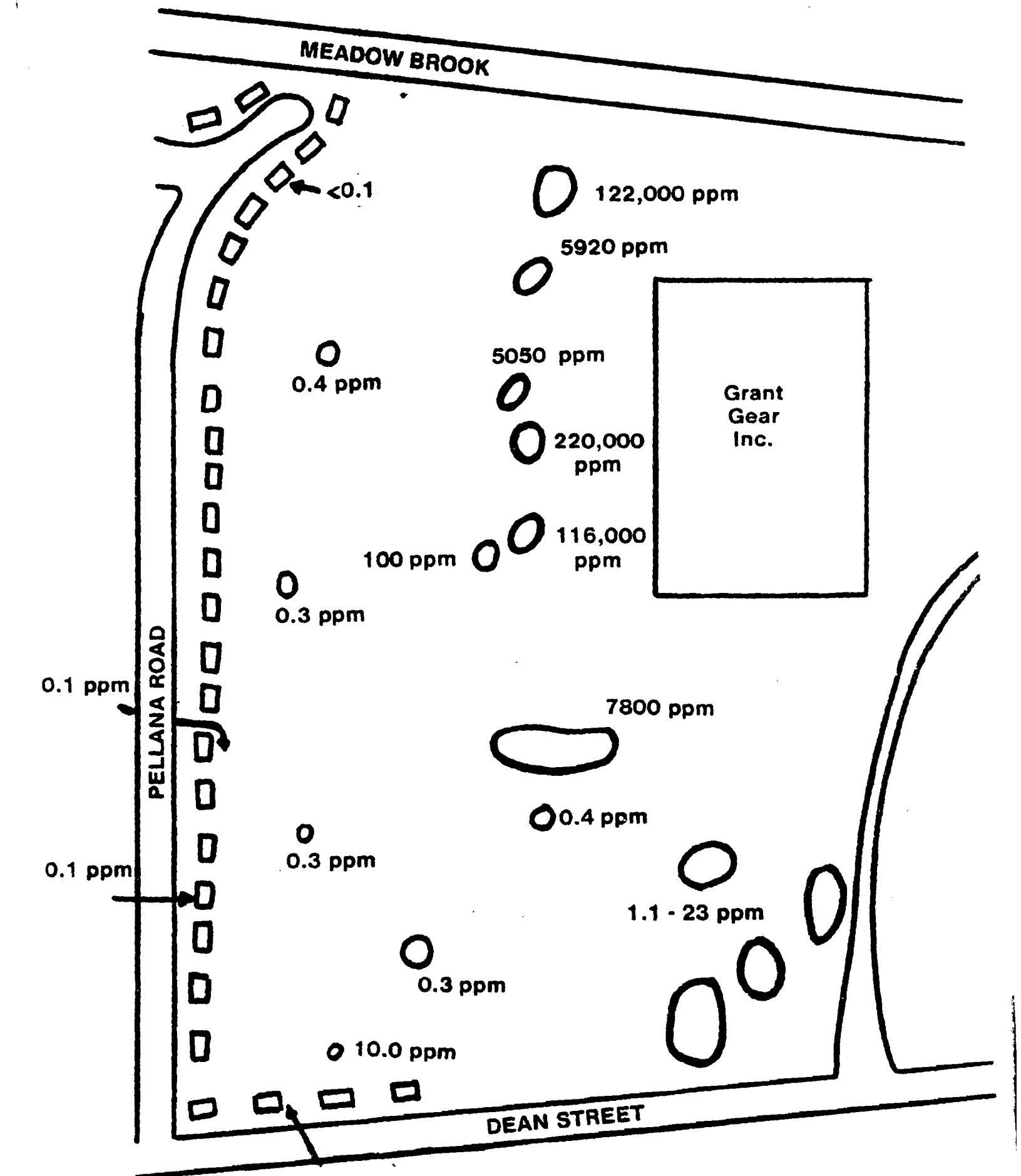
ENVIRONMENTAL EXPOSURE ASSESSMENT

The MDPH developed a strategy to determine whether significant exposure to PCBs had occurred. Since PCBs are not very volatile, simply living in the area around the site would not necessarily constitute exposure. Furthermore, testing had revealed that migration from the site to the surrounding neighborhood soils had not taken place, and neither the brook running through the site nor its sediments were contaminated. The greatest potential for exposure was by actual skin contact with the contaminated soil or by inhalation of dust kicked up by walking, playing, biking, etc., on the site. The goal of the environmental exposure assessment, therefore, was to determine who had been on the site the most.

To conduct the assessment, information was obtained by interviews, detailing the respondent's history of use of the site. A group of people determined to have been on the site the most had their blood tested for PCBs.

FIGURE 1

PCBs IN SOIL - NORWOOD



QUESTIONNAIRE

The questionnaire was developed with the help of an expert from the federal Centers for Disease Control (CDC) in Atlanta. Since many residents stated that all members of the household had been on the site, a household questionnaire was devised. That is, one person from the household answered questions about all current and former (family members who had moved away) residents of the household. The questionnaire was brief, as the telephone survey (contacting 325-350 households) had to be completed in two weeks.

Respondents were asked to answer the following questions:

1. What activities had household members engaged in on the site itself, and with what frequency had they engaged in those activities?
2. Had any member of the household used any soil from the site on their own property?
3. How long, if at all, had members of the household lived in the Meadowbrook area?

In addition, two questions were designed to evaluate whether any member of the household had been occupationally exposed to PCBs. Studies have shown that workers occupationally exposed to PCBs have blood PCB levels higher than background levels in the population. It has also been shown that occupationally exposed workers have family members with blood PCB levels higher than expected background levels. Since the survey was designed to assess the effect contact with the contaminated site (and not occupational exposure) may have had on blood PCB levels, families where at least one person worked in an occupation exposing them to PCBs were not tested.

PERSONS INTERVIEWED

The Town of Norwood made the questionnaire available to all current and former residents. The Department surveyed all residents in the Meadowbrook area, since they had a higher probability of having been on the site than those not living in the Meadowbrook area. Residents who had not filled out the questionnaire at the Town Hall were called and interviewed over the phone.

For the random survey, a directory listing all residents (age 17 or older) in the town of Norwood by street was obtained. Fifty pages from the directory were randomly selected and five households were randomly selected from each page. In all, about two hundred and fifty households were selected.

RESULTS OF THE QUESTIONNAIRE

The response rate in the Meadowbrook area was excellent, with 90% of the households completing the questionnaire. In the random survey, the response rate was 76%. Initially, 29% of the random sample had either unlisted phone numbers, disconnected phone numbers, or no phone number. Each one of these households was sent a letter and stamped self-addressed postcard requesting that they either contact the MDPH or send in a phone number where they could be reached.

About 250 households, not located in the Meadowbrook area and not part of the random sample, voluntarily filled out questionnaires at the registration. MDPH staff reviewed all these self-administered questionnaires. In addition,

due to the fact that numerous brush fires occurred on the site, a number of firefighters completed the questionnaires. The total number of household questionnaires completed was approximately 760.

The number of residents accounted for in all the questionnaires is shown in Table 1. The numbers were derived by counting current and former residents listed on each of the household questionnaires.

TABLE 1

Number of Residents Accounted for in Questionnaire

Meadowbrook Residents	1430
Other Norwood Residents	
From Random Sample	614
Self-Administered	626
Non-Norwood Residents	
Self-Administered	204
Firefighters	27
TOTAL	2901

RANKING

Once questionnaires were completed, a ranking system to determine which people had the greatest amount of contact with the site was devised. First, all questionnaires where one of the activities was checked with a frequency of "every day" or where at least four activities were checked with "once a week" were picked out. This was less than one-third of the total number of questionnaires. All firefighters were also set aside, since exposure to PCBs via inhalation could have been high for these firefighters. From the selected questionnaires, those having an occupational confounder were removed.

Points were assigned in three separate categories. If the questionnaire indicated the respondent lived at least five years in the Meadowbrook area, one point was given. Under the activities section, the following number of points were given.

	activity checked with a frequency of: every day	once per week
camping/picnicking	5	3
walking/jogging	2	1
playing	5	3
biking	4	2

The rationale behind the points assigned to the various activities related to the expected amount of skin contact with the soil or ingestion or inhalation of possible contaminated dust. Thus, biking and playing were scored higher than simply walking through the area.

If soil from the site was used on the property of the respondent, five points were assigned to the questionnaire. There could have been much skin contact over a prolonged period of time with this soil, or ingestion of contaminated vegetables grown in the soil.

Once the numbers were assigned, the questionnaires were placed in four separate categories (see Table 2).

TABLE 2

Categories Designating Degree of Contact with the Site (based on point total)

Category	Point Total
High	>12
Mid-High	10-12
Medium	7-9
Low	< 7

In some cases, respondents described skin problems (such as rashes or lesions) in certain household members, or other unusual circumstances that might have led to high exposure. These questionnaires were placed into a so-called "unclassified" category.

Households with questionnaires in the top two categories of "high" and "mid-high" contact with the site, along with the unclassified group, were chosen for blood sampling. Also chosen were seven firefighters who reported at least five years of working for the Fire Department. Each household chosen for testing was contacted to suggest who in their household had the greatest amount of contact with the site. The people chosen for testing are shown in Table 3.

TABLE 3

Individuals Selected for Blood Testing

Category	Number
High	33
Mid-High	54
Unclassified	6
Firefighters	7
TOTAL	100

TESTING

Testing was done at the Norwood Hospital. The CDC provided a detailed health questionnaire which was administered to all residents who had blood samples taken. A representative of the CDC trained two public health nurses to administer the questionnaire.

Of the one hundred residents chosen for testing, 88 were actually tested. The remainder of the group were not tested for the following reasons:

No-Shows	4
Refused Testing	6
Unable to reach	2
TOTAL	12

In addition, one resident was mistakenly interviewed and tested, and one resident with an occupational exposure was tested. This brought the total number of samples to 90.

The age range of those tested was 11-66 (see table 4).

TABLE 4

Age Distribution

Age	Percentage
10-19	21
20-29	54
30-39	17
40+	8

ANALYSIS

The first 30 samples were analyzed in the CDC laboratories in Atlanta by personnel from the Department's State Laboratory Institute. Initial analysis was done at CDC to standardize the analytical procedure in order to allow comparisons to other U.S. results. The remaining 60 were analyzed at the State Laboratory Institute in Jamaica Plain.

RESULTS

The results are shown in Figure 2. To place them in perspective, 99% of the U.S. population have blood levels of 30 ppb or less.[1] All the results, with the exception of one, were less than one-half of 30 ppb. The one individual with 30 ppb in the blood had been occupationally exposed to an oil than may have contained PCBs. Thus, the 30 ppb level could not be definitively attributed to exposure to PCBs at the site.

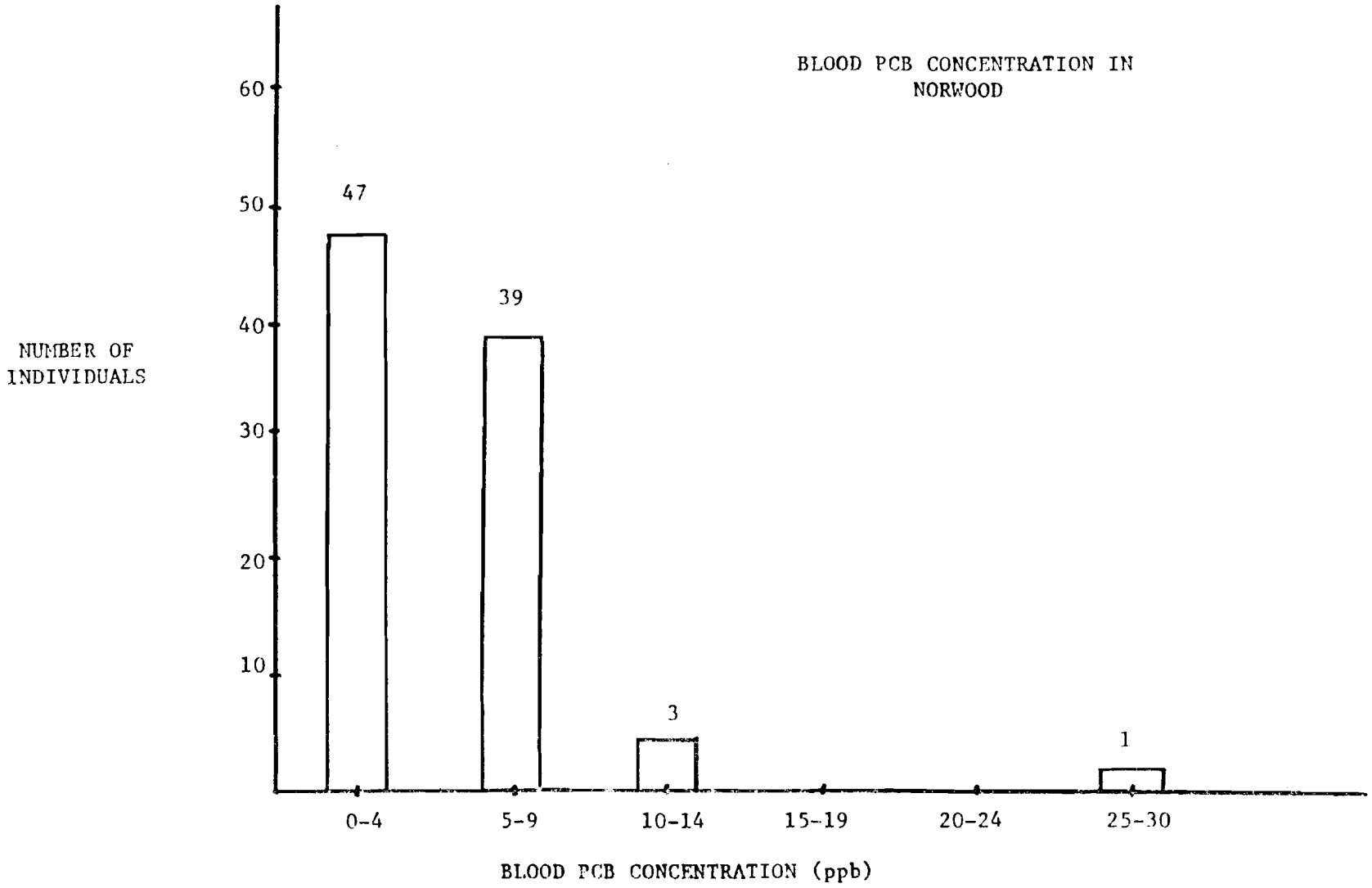
CONCLUSION

Based on the blood results, minimal, if any, exposure to the contaminated soils occurred. Since the individuals tested had the greatest potential for exposure to the PCBs, other residents should be reassured that their blood levels are within the background levels expected in any U.S. population. Therefore, Norwood residents should not be concerned about health risks attributable to the Norwood site, since there was no significant exposure.

1. Personal communication with John Little, C.D.C., Atlanta.

MS/bj

FIGURE 2


BLOOD PCB CONCENTRATION IN NORWOOD
NUMBER OF INDIVIDUALS
60
50
40
30
20
10
47
39
3
1
0-4
5-9
10-14
15-19
20-24
25-30
BLOOD PCB CONCENTRATION (ppb)